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LOW VISION EVALUATION FOR ORIENTATION AND MOBILITY

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PREFACE

In January of 1970, Mr. Loyal E. Apple, the Chief of the Western Blind Rehabilitation Center, initiated a program in which the specific aim was to expand the knowledge and training of the Center staff concerning legally blind persons with residual vision, and to begin to develop program content specifically directed toward the needs of these low vision persons. The outgrowth of this program led to the establishment of an interdepartmental low vision committee to coordinate these efforts, and to a number of low vision seminars and the development of a low vision (NEAR) unit.

Within the Orientation and Mobility Section, the first objective was to develop some workable procedures with which an individual's vision could be evaluated in terms of its practical usefulness for orientation and mobility purposes. The functional vision evaluation procedures which are in use at this Center today, and which are briefly described in the following paper, have evolved very slowly since that beginning over a year and a half ago, and they are still in the process of evolution and development. In working with approximately 70 low vision persons during this time, many ideas have been tried out. Some have been discarded, some have been refined and expanded, and hopefully, new ideas and further improvements will continue to be added in the future.

The following paper, with the accompanying slides and dialogue, is simply a descriptive report. It describes the basic concepts, assumptions and subsequent procedures on which we have founded our approach to the problem of functional vision evaluation. The presentation outlined in this paper was originally intended to serve only as an educational tool, to be used here at this Center as one part of our ongoing inservice training program. It was not initially written for the purpose of publication or distribution. I think that it is important for the reader to keep these comments in mind so that some of the inherent limitations of the paper will be clear, and it can be interpreted in its proper context. However, if it can serve to stimulate interest in the area of low vision and generate new ideas among other professionals in the field of blind rehabilitation, then it will have served another purpose and perhaps, in the long run, a more important one.

This long range goal is fundamentally important. It is important because what this paper does not indicate is that very often our evaluation techniques are not sufficiently refined to objectively measure any significant differences in visual functioning. This occurs even when we know subjectively that the visual impairment is real and valid and significant to the individual. And, more importantly, this paper does not indicate that, even when we are able to identify areas of deficient visual functioning, we too often find ourselves at a loss as to how to provide a training program with any effective and meaningful content. Thus, after over a year

and a half of work with low vision persons, it is this realization which stands out in my own mind, that as professionals in the field of orientation and mobility, we do not have sufficient knowledge or understanding of the visual functioning of low vision persons, and we are grossly unprepared to provide training which can deal realistically with their travel needs.

In closing, I would like to add that the work represented in this paper is the result of the combined effort of the entire Orientation and Mobility staff at the Western Blind Rehabilitation Center. In particular, the conscientious efforts of Mr. Howard Wooling, Mr. Mathew Angus, and Mr. Stephen Dizel have been an invaluable contribution to this program. However, I should also add that any statements of opinion or any conclusions represented in this paper are my own, and do not necessarily represent those of the Western Blind Rehabilitation Center or any particular members of the staff.

DONALD C. COOPER
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I. Functional Vision as an O&M Concept

The purpose or objective of any rehabilitation training is to assist the individual in achieving an optimal level of active and productive participation in society. For the O&M Specialist working with a visually impaired person, this means that he directs his knowledge and training to the individual's interaction with his environment in terms of the ease, the confidence, the safety and the independence of his mobility in that environment. It is for this reason that the O&M Specialist becomes especially interested in the visually impaired person's observable behavior, behavior in which he is responding to and acting upon his environment. In this respect, the approach is essentially pragmatic and practical in nature. The O&M Specialist asks the questions, "How well does the visually impaired person function in dealing with the demands of independent mobility in the environment, and what can be done to improve his functioning?"

For an O&M Specialist, the questions above remain the same, regardless of whether the visually impaired person is totally blind or has a substantial amount of useful remaining vision. In either case, the purpose of the O&M Specialist is to evaluate all the sensory capabilities of the individual, and to develop those capabilities so that he can gather information from the environment which will enable him to travel with safety, efficiency and independence. But, because the visual modality exercises such a dominant influence for purposes of orientation and mobility, an accurate evaluation of the functional use of any residual vision becomes the primary concern. This is necessary in order to identify those tasks or behaviors or circumstances in which the low vision person does not function adequately. It is only after one has defined the specific areas of need, and the nature of their relationship to effective functioning, that one can develop a realistic training program.

The concept of functional vision does not consider the visual system in isolation. It considers the total individual with all his unique qualities, and considers how he operates in the environment with his particular visual system in cooperation with his other sensory modalities. Because the concept

of functional vision is a comprehensive one, and considers the operation of the visual sense in the context of overall functioning, the task of evaluating the functional use of an individual's remaining vision is not a simple and straight forward problem. Within the individual himself, there are a multitude of variables, both physical and psychological, which can in some way effect functional vision. In addition, we are also dealing with the everyday travel environment which is also dynamic and complex. Out of the many variables involved in the interaction between the low vision person and his environment, it can be extremely difficult to identify those variables, or combinations of them, which have a significant influence on the visual functioning of the low vision person.

II. The Necessity for a Functional Vision Evaluation

A. Acuity vs. Functional Vision

1. One does tend to expect a significant amount of visual travel from persons with visual acuities approaching 20/200. However, there are exceptions to this. On the other hand, this does not mean that a low acuity necessarily indicates very little useful vision for travel purposes.

2. Reported measures of visual acuity are not always accurate or reliable.

3. Visual acuity may fluctuate due to the eye condition or environmental circumstances.

4. Visual acuity measures central vision but it does not describe the peripheral vision. Experience has shown that the extent and the character of the visual field are very important in mobility.

B. Variability of Functional Vision

1. Certain eye conditions, such as diabetes, result in vision which is not stable. Vision may fluctuate from day to day or from hour to hour. Any changes in the diet or amount of exercise can easily percipitate such fluctuations.

2. Some drugs or medications may also cause vision to fluctuate.

3. Psychological factors such as motivation, confidence, attention, etc. can have a profound influence on observed visual functioning.

4. Environmental factors such as the size, color and distance of objects, figure-ground contrast and complexity, the intensity and positioning of lighting, and the speed and angle of motion of moving objects can all have dramatic effects on visual functioning.

5. To an extent, the characteristics of the eye pathology may predict some variables which will have a significant effect on visual functioning, but they cannot predict the degree or the magnitude of the effects on behavior.

C. Verbal Report vs. Observed Behavior

1. Verbal reports from low vision persons do not always accurately reflect their observed behavior.
   a. They may consciously misrepresent their visual condition for a variety of reasons.
   b. They simply may not be able to describe their condition with any clarity.
   c. They may be confused or uncertain or inaccurate in their perception of their condition, especially if the visual loss is recently acquired.

III. Low Vision Evaluation Procedures at the Western Blind Rehabilitation Center.

A. Design

1. The evaluations are designed to sample orientation and mobility behavior in three general types of environment, 1) indoor, 2) residential, 3) business.

2. Procedures are designed to enable instructors to record observations of behavior as objectively as possible, but also to provide the opportunity to make more subjective, clinical judgements of travel performance in typical travel environments.

3. Procedures must be designed so that they are practical and convenient for the staff to administer within the organizational framework of the orientation and mobility program.

B. Description of Procedures

1. Standardized evaluations: use slides with accompanying dialogue.

a. Recreation Room

b. Dining Hall

c. Parking Lot

d. Residential

e. Business

2. Night Evaluations

These evaluations are conducted in the residential and business areas. The instructor has the alternative to plan his own evaluations, or he may use the same areas and procedures that are used for the daytime evaluations.

3. Special Evaluations

These evaluation procedures and the locations where they are conducted are determined by the individual instructor. They are based on his judgement as to the individual needs and capabilities of his student. Some typical special evaluations are:

a. Public transportation

b. Department stores and shopping centers

c. Heavy traffic conditions

d. Complex urban travel

e. Rural travel

f. College campus

(Appendix to Section B)

Description of Procedures (Dialogue for Slides)

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Introduction--Standardized Evaluations:

The following slides have been taken to illustrate some of the evaluation procedures and selected areas which have been used at the Western Blind Rehabilitation Center when working with low vision students. The slides progress from static indoor environments to the more complex residential and business travel environments. This is the chronological order in which the student is introduced to the evaluations. The total evaluation may take from one to two weeks depending on the student.

Slide #1: This slide is taken in the recreation room of the Blind Rehabilitation Center building. The student is standing with his back to the main door of the room viewing the left side which is lighted. The size of the objects in this room and their distance from him have been pre-determined. With the window shades drawn, the light intensity in this area measures about 20 ft. candles at eye level.

Some significant items which you might notice are: The light colored table and chair with bright chrome, as compared with the rest of the furniture which is rather dark, the three tan chairs to the right which can be mistaken for a sofa, and the pillars which provide a reference point for the students' estimation of distance and perspective.

Slide #2: The student is standing with his back to the pillar in the foreground of the previous slide, and views the same area of the room. This position provides a correlation of his responses to the same objects at a closer distance.

Slide #3: This slide is taken at the first position again, with the student's back to the main door, but this time he is viewing the right side of the room which has the lights off. The lighting on this side of the room is about 1 1/4 ft. candles at eye level. This is to provide a correlation of responses to similar objects at similar distances but under dim lighting conditions.

Slide #4: This slide is taken with the student's back to the pillar in the previous slide, again viewing the dimly lighted side of the room. And again, the purpose of this position is to observe the student's responses to the same area but at a closer distance.

Slide #5: This slide shows a sample page of the data form which is used when giving the evaluation in the recreation room. You will notice that the names of the objects and their distance from the student are listed. Then there are three columns for the three different categories of responses which we use. The first category is positive identification, and simply means that the student is able to identify the object by name. The second category is description, and means that the student can describe some of the object's significant characteristics, such as size, shape, and color, but is unable to identify it by name. The last category is recognition and means

that the student is aware of the presence of an object but cannot accurately describe it. The evaluator simply checks the appropriate response, if any, to each object and writes down any comments or additional information which seems pertinent.

Slide #6: The next evaluation which is given to the students is conducted in the hospital dining hall which the students use. The type of evaluation procedures, and the data forms used, are identical to those used in the recreation room. The importance of the dining hall evaluation is that the environmental conditions are significantly different from those in the recreation room.

In this slide, the student is standing with his back to the main entrance of the dining hall viewing the right side of the room. You will notice that, compared to the recreation room, this area is larger and brighter (about 100 ft. candles at eye level) and has objects and background which are lighter in shade and more neutral in contrast.

Slide #7: In this slide, the student is standing with his back to the serving line of the dining hall viewing the main entrance. You will notice the bright outside lighting and the large open dining area to the left. This position can be useful in observing the behavior of students with photophobic conditions or any manifestations of spatial distortion.

Slide #8: The next series of slides are concerned with what we call the parking lot test. In this evaluation, the student is taken to a

large, open parking lot area, and is asked to observe and evaluate persons walking in a series of specified patterns.

In this first section, the student is asked to observe a person walk four different geometric patterns, and to identify each pattern. The evaluator indicates the distance at which each correct or incorrect observation is made and records any relevant comments concerning the the student's behavior.

Slide #9: This slide is a diagram intended to illustrate the conditions described in the previous slide.

Slide #10: In this section, the student is asked to watch two people walk past each other on parallel lines of travel. They do this at three different angles relative to the direction he is facing. For the first three trials, the student is standing still. For the last three trials, he is walking toward the people in front of him. On each trial, his task is to identify which person was closest to him.

Slide #11: This diagram illustrates the first part of the motion-convergence section just described.

Slide #12: This slide illustrates the second part of the motion-convergence section in which the student is walking straight ahead.

Slide #13: The next two sections of the test are concerned with the student's depth perception. In the first part, he observes one

person walking directly toward him and another person walking directly away from him. His task is to determine when these two people are exactly side by side.

In the next part the student observes two people standing out in front of him. His task is to determine which person is closest to him and which is farthest away. He may walk up to them as close as necessary to make this judgement.

Slide #14: This slide illustrates the two parts of the evaluation concerning depth perception which were outlined in the previous slide.

Slide #15: In this section of the test, the student is standing still and is told that the persons walking toward him will be on a collision or noncollision (just miss) course. His task is to determine, as soon as possible, whether each person will hit or miss.

Slide #16: The slide illustrates the section on collision or noncollision courses described in the previous slide.

Slide #17: In this section of the test, the student is walking straight ahead. Again, there will be people converging toward him on collision or noncollision courses. His task is to determine, as soon as possible, if a collision would occur if he continued straight ahead. If a collision would occur, he is to alter his course in order to avoid the collision.

Slide #18: This slide illustrates the section on collision avoidance described in the previous slide.

Slide #19: The next evaluation following the parking lot test is travel in a residential area. In this evaluation, the student is asked to travel a specific five block route, and to return to this starting point by an alternate route. This slide shows one location along the residential evaluation route. You will notice the heavy growth of shrubs and trees which gives a distinct, but very irregular guideline. At any time of day, there are numerous dark shadows to deal with, and at night this area is particularly dark and poorly lighted. The lighting when this slide was taken was 4000-6000 ft. candles. There is also a tree which comes out into the middle of the sidewalk and the sidewalk curves around both sides of the tree. Just beyond this tree, the sidewalk begins to curve to the left, and this is an unusual situation which the student would not be anticipating.

Slide #20: This slide was also taken along the residential evaluation route. It is a fairly typical residential intersection except for the blended curb and the high rounded contour of the streets which, to an extent, reverses the usual depth perspective at a curb situation. By observing the student in this situation, it is sometimes possible to get some indication as to the degree to which the student uses cues of contrast and depth in dealing with curbs.

Slide #21: This is the data form which is used when conducting the residential evaluation, and it indicates those aspects of the person's travel performance which are considered important. Within each of these categories, a pass-fail criteria has been defined for

the critical events which may occur. The evaluator keeps a tally of the travel errors which occur and also records the travel time for the return trip on the evaluation.

Slide #22: Following the residential evaluation, the student is evaluated in the business area. This is a sample page from the data form which is used when conducting the business evaluation. As you can see, within each block of the business run there are three or four objects or situations which are listed. The student is told at the beginning of each block the list of items he is to locate and identify, but he is not told where they are in the block or in what order. The student is also told to stop when he first locates each item so that the evaluator can estimate and record the distance. You will notice at the bottom of the page several other categories such as curbs, stoplights, objects contacted, use of cane etc. The student's performance in each of these areas is evaluated and recorded in the same manner that was used in the residential evaluation.

Slide #23: This slide is the starting point of the business evaluation route. It is a light business, stoplight controlled street crossing, which is off-set to the right. The direction for this crossing is not consistent with the previous line of travel, previous guidelines, or the parallel traffic. To get an accurate direction for this crossing, it is almost essential to utilize visual information such as the crosswalk lines, an object on the opposite corner, or other pedestrians, etc. The lighting when this slide was taken was about 6000 ft. candles.

Slide #24: This is a curbed driveway to a parking lot in mid-block in the same light business area. This situation is unusual because the curb occurs in mid-block, and also because the curb itself is painted white with two changes in the color or shade of the sidewalk surface just preceeding the curb. This situation provides variation in the dimensions of contrast and depth which is useful in evaluating the students ability to perceive and interpret this information.

Slide #25: This slide shows a typical building line in the light business area. Some items which are considered in this block are the barber pole and hanging sign in the distance, the color change in the sidewalk, and the alley in the distance which is off-set to the right. In this situation, it is possible to induce any self-styled scanning a student may have, because he does not know in what order he will find these items. He must try to be looking straight ahead, over-head, at ground level, and along the building line, and to be continuously aware of the visual information in each of these directions while he is moving.

Slide #26: This slide is an example of the kind of horizon characteristic, i.e. an isolated tall building, which many low vision students are capable of using as a landmark for general orientation from a distance. This slide was taken in midmorning and the illumination was about 6000 ft. candles.

Slide #27: This slide is just to illustrate a typical area of the downtown business environment. The student may be asked to visually

locate specific objects or to find destinations which have been verbally described to him. The lighting when this slide was taken varied from 500 to 6000 ft. candles depending on the shadows and location.

Slides #28 and #29: The next two slides view the entrance to a sloped tunnel which goes under the railroad tracks. It provides a good situation in which to observe the students reaction to sudden and extreme changes in lighting conditions. Within the tunnel, the mercury lamps provide 32 ft. candles of illumination directly under them at eye level. However, this type of lamp provides a rather restricted cone of light, and the illumination diminishes rapidly between light sources.

Slide #30: If the low vision evaluations have indicated that the student does have a substantial amount of useable remaining vision, he will also be evaluated with several different types of monocular optical aids. Finding a useful monocular telescope can often only be accomplished by the tedious trial and error method and a good deal of practice. ✓